Option Modules

BACnet MSTP Communications Option

HA501940U001 Issue 1
Technical Manual

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

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ENGINEERING YOUR SUCCESS

AC30 BACnet MS/TP Option

Technical Manual
HA501940U001 Issue 1

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Safety Information

Requirements

IMPORTANT: *Please read this information BEFORE installing the equipment.*

Intended Users

This manual is to be made available to all persons who are required to install, configure or service equipment described herein, or any other associated operation.

The information given is intended to highlight safety issues, EMC considerations, and to enable the user to obtain maximum benefit from the equipment.

Complete the following table for future reference detailing how the unit is to be installed and used.

INSTALLATION DETAILS	
Model Number *(see product label)*	
Where installed *(for your own information)*	

Application Area

The equipment described is intended for industrial motor speed control utilising AC induction or AC synchronous machines.

Personnel

Installation, operation and maintenance of the equipment should be carried out by competent personnel. A competent person is someone who is technically qualified and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

Product Warnings

DANGER Risk of electric shock	**WARNING** Hot surfaces	**Caution** Refer to documentation	**Earth/Ground** Protective Conductor Terminal

CAUTION!

APPLICATION RISK

- The specifications, processes and circuitry described herein are for guidance only and may need to be adapted to the user's specific application. We cannot guarantee the suitability of the equipment described in this Manual for individual applications.

RISK ASSESSMENT

Under fault conditions, power loss or unintended operating conditions, the drive may not operate as intended. In particular:

- Stored energy might not discharge to safe levels as quickly as suggested, and can still be present even though the drive appears to be switched off
- The motor's direction of rotation might not be controlled
- The motor speed might not be controlled
- The motor might be energised

A drive is a component within a drive system that may influence its operation or effects under a fault condition. Consideration must be given to:

- Stored energy
- Supply disconnects
- Sequencing logic
- Unintended operation

Safety Information

DANGER! - Ignoring the following may result in injury

1. This equipment can endanger life by exposure to rotating machinery and high voltages.
2. The equipment must be permanently earthed due to the high earth leakage current, and the drive motor must be connected to an appropriate safety earth.
3. Ensure all incoming supplies are isolated before working on the equipment. Be aware that there may be more than one supply connection to the drive.
4. There may still be dangerous voltages present at power terminals (motor output, supply input phases, DC bus and the brake, where fitted) when the motor is at standstill or is stopped.
5. For measurements use only a meter to IEC 61010 (CAT III or higher). Always begin using the highest range.
   CAT I and CAT II meters must not be used on this product.
6. Allow at least 5 minutes for the drive's capacitors to discharge to safe voltage levels (<50V). Use the specified meter capable of measuring up to 1000V dc & ac rms to confirm that less than 50V is present between all power terminals and between power terminals and earth.
7. Unless otherwise stated, this product must NOT be dismantled. In the event of a fault the drive must be returned. Refer to "Routine Maintenance and Repair".

WARNING! - Ignoring the following may result in injury or damage to equipment

SAFETY

Where there is conflict between EMC and Safety requirements, personnel safety shall always take precedence.

- Never perform high voltage resistance checks on the wiring without first disconnecting the drive from the circuit being tested.
- Whilst ensuring ventilation is sufficient, provide guarding and /or additional safety systems to prevent injury or damage to equipment.
- When replacing a drive in an application and before returning to use, it is essential that all user defined parameters for the product's operation are correctly installed.
- All control and signal terminals are SELV, i.e. protected by double insulation. Ensure all external wiring is rated for the highest system voltage.
- Thermal sensors contained within the motor must have at least basic insulation.
- All exposed metalwork in the Inverter is protected by basic insulation and bonded to a safety earth.
- RCDs are not recommended for use with this product but, where their use is mandatory, only Type B RCDs should be used.

EMC

- In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.
- This equipment contains electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling, installing and servicing this product.
- This is a product of the restricted sales distribution class according to IEC 61800-3. It is designated as “professional equipment” as defined in EN61000-3-2. Permission of the supply authority shall be obtained before connection to the low voltage supply.

Disposal

Waste Electrical and Electronic Equipment (WEEE)

Waste Electrical and Electronic Equipment - must not be disposed of with domestic waste.

It must be separately collected according to local legislation and applicable laws.

Parker Hannifin Company, together with local distributors and in accordance with EU directive 2002/96/EC, undertakes to withdraw and dispose of its products, fully respecting environmental considerations.

For more information about how to recycle your Parker supplied waste equipment, please contact your local Parker Service Centre.

Packaging

During transport our products are protected by suitable packaging. This is entirely environmentally compatible and should be taken for central disposal as secondary raw material

Contents **Page No.**

AC30 BACnet MS/TP Option

Introduction

Features

- BACnet MS/TP device
- Linear network topology supported
- Supports baud rates 9600, 19200, 38400, 76800 bps
- Network Status and Module Status LEDs
- Change Of Value (COV) notification and Alarm/Event functionality supported
- May be used with the GPIO option with real-time clock

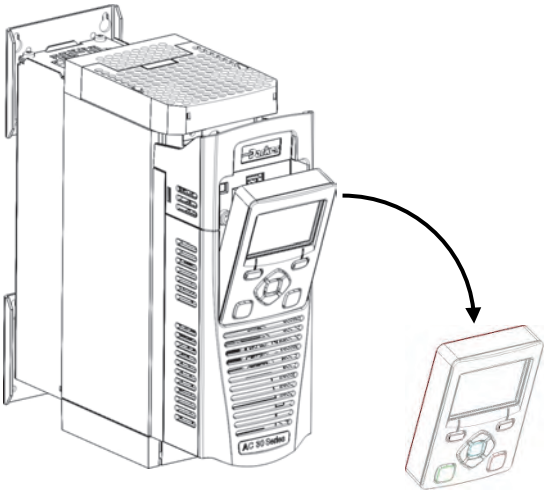
The Product Code

The product code for the BACnet MS/TP option is:

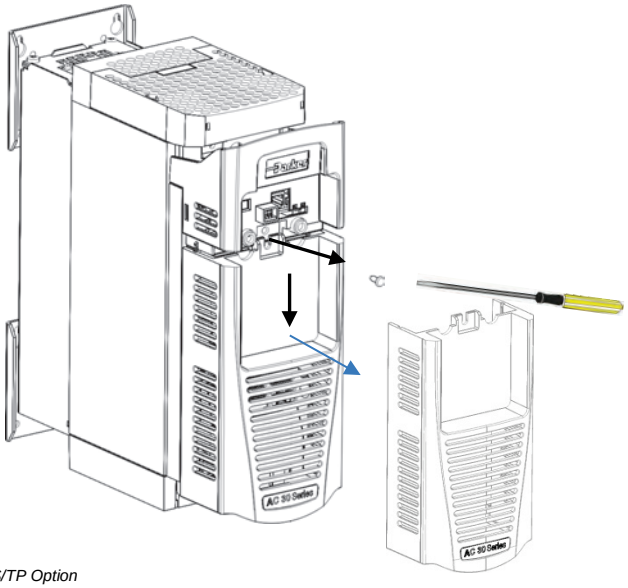
7003-BN-00

Installation

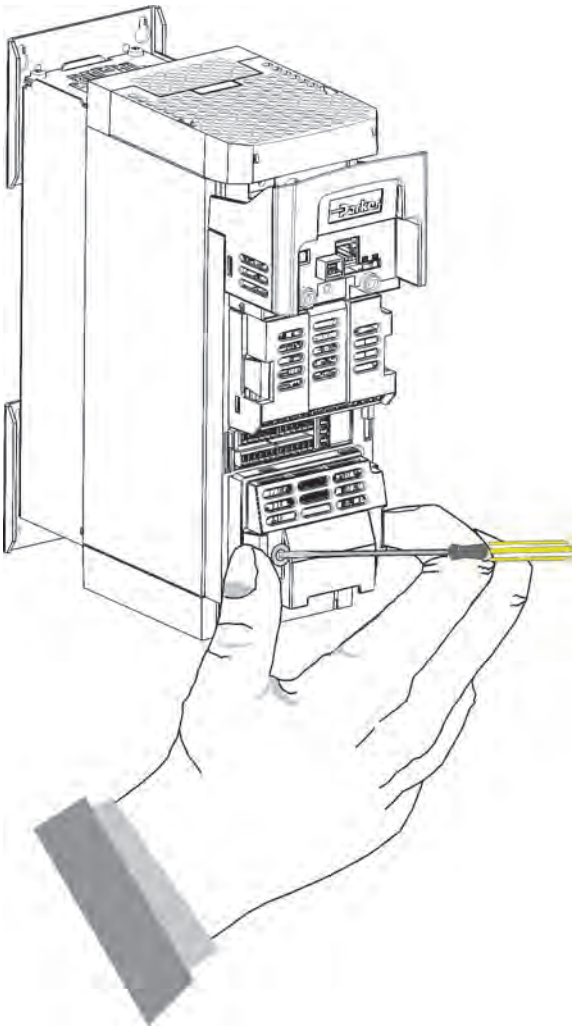
1. Remove the Graphical Keypad (GKP) by pulling from the top down, and remove.



2. After removing the screw slide the control module lower cover down slightly and then remove.

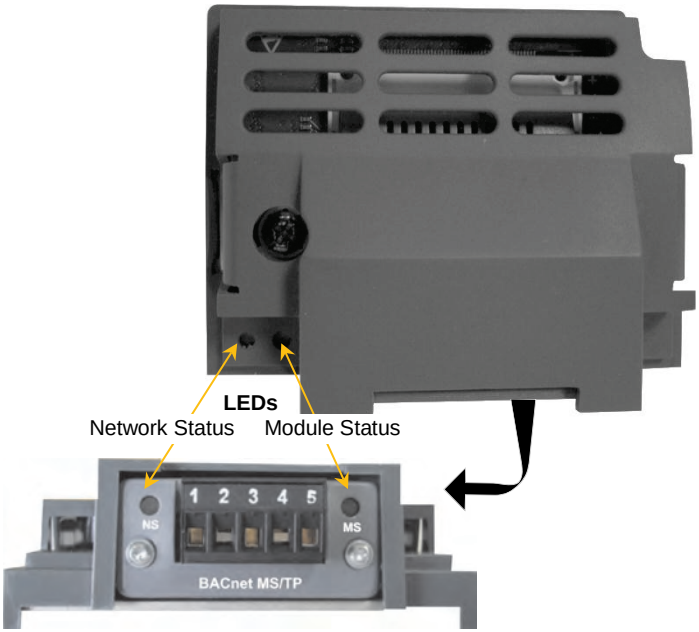


3. Click the Option into place and tighten the retaining screw, as shown.



4. Slide and click back the control module lower cover, tighten the retaining screw and slot back the GKP.

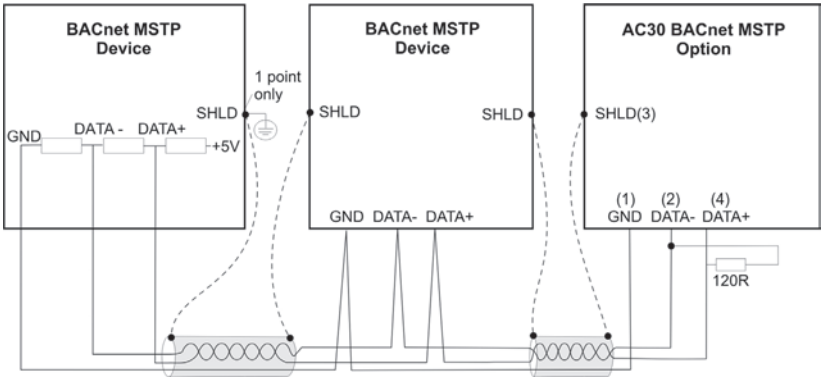
Connecting to the BACnet MS/TP Network



Pin	Signal	Description
1	Gnd	Signal Common
2	Data-	Negative RS485 RxD/TxD
3	Shield	Cable Shield
4	Data+	Positive RS485 RxD/TxD
5	Not used	-

Cable: Use of STP or FTP screened cable is recommended.

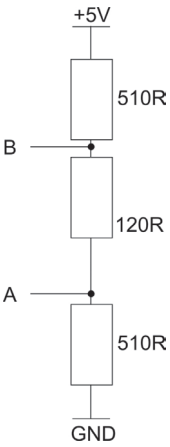
Wiring Diagram Example



Termination and Biasing

Both ends of the network need terminating. A resistor of 120Ω is recommended where an AC30 is at the end of the network. For other devices, check the manual to see if it has internal or switchable terminators.

The network also needs to be biased. This is typically done at one end of the network, combining the biasing and termination as shown below. The node will require access to a network-side +5V.



LEDs

Network Status (NS) LED

State	Indication
Off	No power
Green	- Online, one or more BACnet messages have arrived - Module has active COV subscriptions - At least one value object has one or more events enabled
Green, flashing	Online waiting for first BACnet message
Red	Fatal error
Red, flashing	- Connection timeout. No BACnet message has been received within the configured process active timeout time. - A COV or Alarm/Event notification could not be sent to its recipient

Module Status (MS) LED

State	Indication
Off	No power
Green	Normal operation
Red	Major fault (Exception state, fatal error)
Red, flashing	Recoverable fault(s)

Configuration

The option requires configuration of the MAC address, Device ID, Baud rate and mapping of AC30 parameters used in COV (Change Of Value) and Alarm/Event notifications. Optionally, a process active timeout value may be set and the Max Master and Max Info Frames properties may be modified.

The **0044 Comms Required** parameter must be set to **BACNET MSTP**.

MAC Address

The **1091 BACnet MAC Address** parameter sets the BACnet MAC address.

Device ID

The **1092 BACnet MSTP Device ID** parameter sets the Device ID (Device Instance).

Baud Rate

The **1093 BACnet Baud Rate** parameter sets the required baud rate for the network. Available baud rates are 9600 bps, 19200 bps, 38400 bps, 76800 bps

Process Active Timeout

The **1094 BACnet MSTP Timeout** parameter specifies how long the option shall stay in the PROCESS ACTIVE state after receiving a BACnet request.

If this is set to zero, then the option will remain in the PROCESS ACTIVE state after receiving the first BACnet request.

Max Master

The **1095 BACnet Max Master** parameter sets the MAX_MASTER property.

Max Info Frames

The **1096 BACnet Max Info Frames** parameter sets the MAX_INFO_FRAMES property.

COV and Alarm/Event Mapping

AC30 parameters used for COV (Change Of Value) notification and for Alarms and Events must be mapped to the write process data. If not, the option has no way of detecting any changes in the value of the parameter.

If the mapping is changed, all COV and Alarm/Event information, that has been stored in non-volatile memory, will be cleared.

Default Mapping

The write process data mapping will contain a factory default mapping. The default mapping may be overwritten if required.

BACnet Objects

The following BACnet objects are supported:

Device Object	Class 8
Notification Class Object	Class 15
Analog Value Object	Class 2
Binary Value Object	Class 5
Multi-State Value Object	Class 19

Within the option there is one Device Object and six Notification Class Objects. The Analog Value, Binary Value and Multi-State Value objects are mapped to the AC30 parameters.

Descriptions of the object properties follow. The following abbreviations are used in the notes:

R read-only property
RW read-write property
NV property is stored in non-volatile memory
M property is only available if the corresponding AC30 parameter has been mapped to the write process data.

Device Object

The Device object contains information about the module as a node on the BACnet network.

Property identifier	Notes	
Object_Identifier	RW	-
Object_Name	RW	This is set to the AC30 Drive Name parameter
Object_Type	R	**DEVICE**
System_Status	R	The status of the system is reported as NON_OPERATIONAL if the option has entered the ERROR state. Otherwise it is reported as OPERATIONAL
Vendor_Name	R	-
Vendor_Identifier	R	**486**
Model_Name	R	-
Firmware_Revision	R	Firmware revision of the option
Application_Software_Revision	R	-
Protocol_Version	R	**1**
Protocol_Revision	R	**7**
Protocol_Service_Supported	R	Bit map stating what protocol services are supported in the object. **1001 0100 000 1011 1100 1000 0010 000 1110 0001**

Property identifier	Notes	
Protocol_Object_Types_Supported	R	Bit map stating what object types are supported in the object. **0010 0100 1000 0001** **0001 0000**
Object_List	R	List filled based on the implemented objects.
Max_APDU_Length_Accepted	R	**1476**
Segmentation_Supported	R	Segmentation supported for both Rx and Tx APDU. **SUPPORTED_BOTH**
Max_Segments_Accepted	R	Number of maximum length APDUs that can be received in a segmented message. **22**
Local_Time	R	The local time is synchronized from the optional Real Time Clock at power up or set from the BACnet network via the TimeSynchronization service.
Local_Date	R	(As above)
APDU_Timeout	RW NV	Default: **10000** milliseconds
Number_of_APDU_Retries	RW NV	Default: **3**
Device_Address_Binding	R	Managed by the APL layer and contains the list of all device address bindings of active client processes inside the BACnet option.
Database_Revision	R NV	Incremented each time an object identifier is changed or the name of a BACnet object is changed.
APDU_Segment_Timeout	RW NV	Default: **5000** milliseconds
Active_COV_Subscriptions	R	Active COV subscription (max.60) entries registered with SubscribeCOV service.

Notification Class Object

The option has 6 instances of the Notification Class object. Each instance contains a list of devices that need to be informed about events and alarms.

Property identifier	Notes	
Object_Identifier	R	-
Object_Name	RW NV	**Notification_Class_#** (default) # = instance number
Object_Type	R	**NOTIFICATION_CLASS**
Notification_Class	R	Equal to instance number
Priority	RW NV	BACnet array of Unsigned values: 0: Number of elements (read-only) 1: TO-OPERATIONAL 2: TO-FAULT 3: TO-NORMAL Default: **{3,0,0,0}** Values 0 - 255 allowed, a lower value has a higher priority.
Ack_Required	RW NV	BACnet Bit string of 3 bits: Bit 0: TO-OFFNORMAL Bit 1: TO-FAULT Bit 2: TO-NORMAL Default: **{0,0,0}** 0 = not set
Recipient_List	RW NV	BACnet list of BACnetDestination primitives. There are 60 list entries available to be configured among the 6 Notification Class instances.
Vendor Property 600: Recipient_Error_Field	R	BACnet bit string of a maximum of 60 bits. The string has one bit per element present in the Recipient_List. If a bit is set an event notification error is present for the corresponding recipient entry in the Recipient_List property.

Analog Value Object

The Analog Value object is mapped to AC30 parameters that represent analog values.

Property identifier	Notes	
Object_Identifier	R	-
Object_Name	R	Mapped AC30 parameter name
Object_Type	R	**ANALOG_VALUE**
Present_Value	RW	Mapped AC30 parameter value converted to Real.
Status_Flags	R	Bit string of Status flags indicating the status of the object. Bit 0: IN_ALARM Bits 1-3: not used – set to FALSE Default: **{F,F,F,F}**
Event_State	R	Valid states: 0: NORMAL 3: HIGH_LIMIT 4: LOW_LIMIT Default: **NORMAL**
Out_Of_Service	R	Always **FALSE**
Units	R	-
COV_Increment	RW NV	Min value: 0 Max value: The max value of the data type of the AC30 parameter. Default: **0**
Time_Delay	RW NV	Time delay for an event to be triggered after occurrence (seconds). Default: **0**
Notification_Class	RW NV	Min value: 0 Max value: 5 Default: **0**
High_Limit	RW NV	Min value: The min value of the data type of the AC30 parameter. Max Value: The max value of the data type of the AC30 parameter. Default: **0**
Low_Limit	RW NV	
Deadband	RW NV	Min value: 0 Max value: The max value of the data type of the AC30 parameter. Default: **0**
Limit_Enable	RW NV	Bit string that determines what TO event limits are enabled. Bit 0: LOW_LIMIT_ENABLE Bit 1: HIGH_LIMIT_ENABLE Default: **{F,F}**

Property identifier	Notes	
Event_Enable	RW NV	Bit string that determines what TO events are enabled. Bit 0: TO-OFFNORMAL Bit 1: not used – set to FALSE Bit 2: TO-NORMAL Default: **{F,F,F}**
Notify_Type	RW NV	Specifies the classification of a TO event that is sent by this object. 0: ALARM 1: EVENT Default: **ALARM**
Acked_Transitions	R M	Bit string that determines what TO events have been acknowledged by a BACnet recipient. Bit 0: TO-OFFNORMAL Bit 1: TO-FAULT Bit 2: TO-NORMAL Default: **{T,T,T}**
Event_Time_Stamps	R M	Array of BACnetTimeStamp that specifies the last TO event stamp that was triggered. Index 0: Number of elements (3) Index 1: TO-OFFNORMAL Index 2: TO-FAULT Index 3: TO-NORMAL

Binary Value Object

The Binary Value object is mapped to AC30 parameters of data type BOOL.

Property identifier	Notes	
Object_Identifier	R	-
Object_Name	R	Mapped AC30 parameter name
Object_Type	R	**BINARY_VALUE**
Present_Value	RW	Mapped AC30 parameter value.
Status_Flags	R	Bit string of Status flags indicating the status of the object. Bit 0: IN_ALARM Bits 1-3: not used – set to FALSE Default: **{F,F,F,F}**
Event_State	R	Valid states: 0: NORMAL 2: OFF_NORMAL Default: **NORMAL**
Out_Of_Service	R	Always **FALSE**
Time_Delay	RW NV	Time delay for an event to be triggered after occurrence (seconds). Default: **0**
Notification_Class	RW NV	Min value: 0 Max value: 5 Default: **0**
Alarm_Value	RW NV	Default: **INACTIVE (0)**
Event_Enable	RW NV	Bit string that determines what TO events are enabled. Bit 0: TO-OFFNORMAL Bit 1: not used – set to FALSE Bit 2: TO-NORMAL Default: **{F,F,F}**
Notify_Type	RW NV	Specifies the classification of a TO event that is sent by this object. 0: ALARM 1: EVENT Default: **ALARM**
Acked_Transitions	R M	Bit string that determines what TO events have been acknowledged by a BACnet recipient. Bit 0: TO-OFFNORMAL Bit 1: TO-FAULT Bit 2: TO-NORMAL Default: **{T,T,T}**
Event_Time_Stamps	R M	Array of BACnetTimeStamp that specifies the last TO event stamp that was triggered. Index 0: Number of elements (3) Index 1: TO-OFFNORMAL Index 2: TO-FAULT Index 3: TO-NORMAL

Multi-State Value Object

The Multi-State Value object is mapped to AC30 parameters of enumerated data type.

Property identifier	Notes	
Object_Identifier	R	-
Object_Name	R	Mapped AC30 parameter name
Object_Type	R	**MULTISTATE_VALUE**
Present_Value	RW	Multistate states begin at 1; therefore the BACnet Present_Value is 1 greater than the AC30 parameter value.
Status_Flags	R	Bit string of Status flags indicating the status of the object. Bit 0: IN_ALARM Bit 1: FAULT Bits 2-3: not used – set to FALSE Default: **{F,F,F,F}**
Event_State	R	Valid states: 0: NORMAL 1: FAULT 2: OFF_NORMAL Default: **NORMAL**
Out_Of_Service	R	Always **FALSE**
Number_Of_States	R	Corresponds to the AC30 parameter maximum value + 1
Time_Delay	RW NV	Time delay for an event to be triggered after occurrence (seconds). Default: **0**
Notification_Class	RW NV	Min value: 0 Max value: 5 Default: **0**
Alarm_Values	RW NV	Default: *empty list*
Fault_Values	RW NV	Default: *empty list*
Event_Enables	RW NV	Bit string that determines what TO events are enabled. Bit 0: TO-OFFNORMAL Bit 1: TO_FAULT Bit 2: TO-NORMAL Default: **{F,F,F}**
Notify_Type	RW NV	Specifies the classification of a TO event that is sent by this object. 0: ALARM 1: EVENT Default: **ALARM**

Property identifier	Notes	
Acked_Transitions	R M	Bit string that determines what TO events have been acknowledged by a BACnet recipient. Bit 0: TO-OFFNORMAL Bit 1: TO-FAULT Bit 2: TO-NORMAL Default: **{T,T,T}**
Event_Time_Stamps	R M	Array of BACnetTimeStamp that specifies the last TO event stamp that was triggered. Index 0: Number of elements (3) Index 1: TO-OFFNORMAL Index 2: TO-FAULT Index 3: TO-NORMAL
State_Text	R	This is mapped to the AC30 parameter enumerated strings
Reliability	R M	Object reliability. 0: NO_FAULT_DETECTED 9: MULTI_STATE_FAULT Default: **NO_FAULT_DETECTED**

BACnet Services

Services Summary

The following services are supported by the BACnet option.

Service	Description
ReadProperty	Reads a single property from a BACnet object
ReadPropertyMultiple	Reads multiple properties from a BACnet object
WriteProperty	Writes a single property to a BACnet object
WritePropertyMultiple	Writes multiple properties to a BACnet object
Who-Is	Used to find out which devices are present on the network and their addresses.
Who-Has	Used to find out what devices in a network are implementing a specific object, using either the object identifier or the object name.
I-Am	The service is sent in response to a matching Who-Is request.
I-Have	The service is sent in response to a matching Who-Has request.
DeviceCommunication Control✦	Turns off the BACnet communication of the device. - Once disabled the device will only respond to DeviceCommunicationControl request and ReinitializeDevice messages. - If only Initiation instead of all communication is disabled, the module will also respond to Who-Is requests.
ReinitializeDevice ✦	Resets devices over BACnet. Only Warm Start is supported on the option.
TimeSynchronization	Synchronizes the current time and date of the module.
SubscribeCOV	Subscribes for changes of value with a BACnet object. The AC30 parameter has to be mapped onto the write process data.
GetAlarmSummary	Responds with a list containing information about all active alarms.
GetEventSummary	Responds with a list containing information about all active alarms and events.
AcknowledgeAlarm	Acknowledge an active alarm.

✦ *The password for these services is "Admin".*

AC30 Specific

Who-Has

The Who-Has service is used to find out what devices in a network are implementing a specific object, using either the object identifier or the object name.

When used to lookup a Value Object via its name, use the format "**Pnnnn**" where **nnnn** is the AC30 parameter number.

For example, to lookup AC30 parameter **0044** use "P0044".

Time Synchronization

The BACnet option may be used with or without a GPIO option that has a Real-Time Clock (RTC).

Without a GPIO RTC option the time and date of the BACnet option is not initialised at power-up or reset. To use the time and date of the BACnet option a network TimeSynchronization message must be received.

With a GPIO RTC option fitted the time and date of the BACnet option will be set to that of the GPIO option at power-up or reset. If a network TimeSynchronization message is received, then this will be used to modify the time and date of the BACnet option and modify the RTC in the GPIO option.

BACnet Parameter Mapping

The AC30 parameters are mapped to BACnet Value objects as summarised in the table below.

The relationship between AC30 parameter number and Value object instance is one-to-one.

AC30 Type	BACnet Object
BOOL	Binary Value
WORD named bits [(a)]	
DWORD named bits [(a)]	
USINT (enumerated) [(b)]	Multi-State Value
SINT	Analog Value
INT	
DINT [(c)]	
USINT	
UINT	
UDINT [(c)]	
REAL	
BYTE	
WORD	
TIME [(c)]	
DATE	Not mapped
TIME_OF_DAY	
DATE_AND_TIME	
STRING	
DWORD	
Arrays [(d)]	

(a) Some AC30 bit string parameters have individual named bits. These bits are assigned their own parameter number and are mapped to the BACnet Binary Value object. See Appendix B – Bit String Parameter Numbers.

(b) Multistate states begin at 1; therefore the BACnet Present_Value is 1 greater than the AC30 parameter value.

(c) 32-bit integer types may lose precision when converted to/from the BACnet Real value.

(d) Parameter arrays cannot be directly mapped to Value objects. However AC30 parameter arrays elements are assigned their own parameter number and are mapped to Value objects depending on their data type. See Appendix A – Array Parameter Numbers.

COV (Change of Value) Notifications

A BACnet device can subscribe for a COV notification from the AC30 BACnet option. The SubscribeCOV service is used to send the identifier of the desired object to activate the notification. A change in the Present_Value property will then trigger a COV notification.

To use this feature the AC30 parameter must be mapped to the Write Process Data. If not, a change in value will go unnoticed and a SubscribeCOV will return the error code COV_Subscription_Failed.

For Binary Value and Multi-State Value objects any change in the Present_Value property will cause a notification to be sent. For Analog_Value objects the property COV_Increment is used to deviced how much a Present_Value needs to change in order for a notification to be sent.

Note: If the Write Process Data is changed or the AC30 is reset or power-cycled then all COV information will be cleared.

Alarm/Event Functionality

A change in the present value of an object can be used to trigger an alarm or event.

Each Value object is associated to a Notification Class object instance, of which 6 are available (0 – 5). Each instance contains a list of recipients of a specific Alarm/Event notification. A total of 60 list entries are available divided among the 6 instances.

Alarm/events are issued every time a value object changes state. The reasons for changing state are specific to each of the three Value objects. The possibility to issue an alarm or an event has to be enabled in each object. This functionality is only available if the associated AC30 parameter is mapped to the Write Process Data.

Note: If the Write Process Data is changed then all Alarm/Event information stored in non-volatile memory will be cleared.

Example Configuration

Configuration Summary

Communications Settings	
MAC Address	10
Device ID	1003
Baud Rate	9600 bps

Write Process Mapping Table		AC30 Data Type	BACnet Value Object
0000	**0395 Actual Speed Percent**	REAL	ANALOG
0001	0000		

Analog Value Alarm & COV Settings	
Instance	395 (Actual Speed Percent)
Notification_Class	0
Notify_Type	Alarm
Event_Enable	To-Offnormal, To-Normal
Limit_Enable	High_Limit_Enable
High_Limit	80.0
Deadband	10.0
COV_Increment	10.0

Notification Class Settings	
Instance	0
Recipient List:	
ValidDays	MTWTFSS
FromTime	00:00:00.00
ToTime	23:59:59.99
Recipient	DE100
ProcessIdentifier	1
IssueConfirmedNotifications	Confirmed
Transitions	To-Offnormal, To-Fault, To-Normal

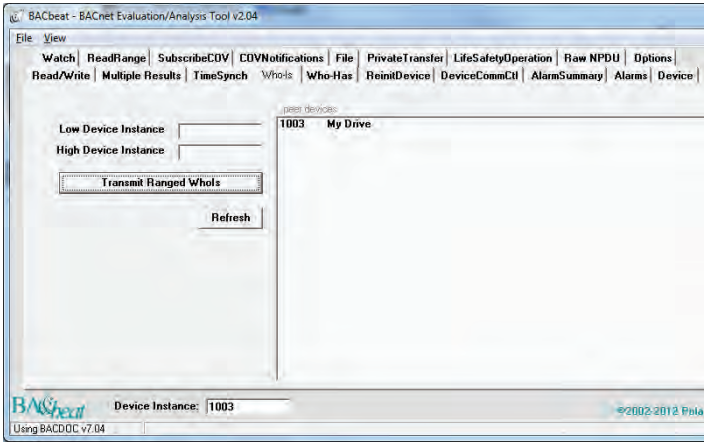
Example Using BACbeat

An example is shown using the software analysis tool BACbeat from PolarSoft Inc ®. Some prior knowledge of the BACnet protocol is assumed.

The Device ID of the BACbeat is set to 100.

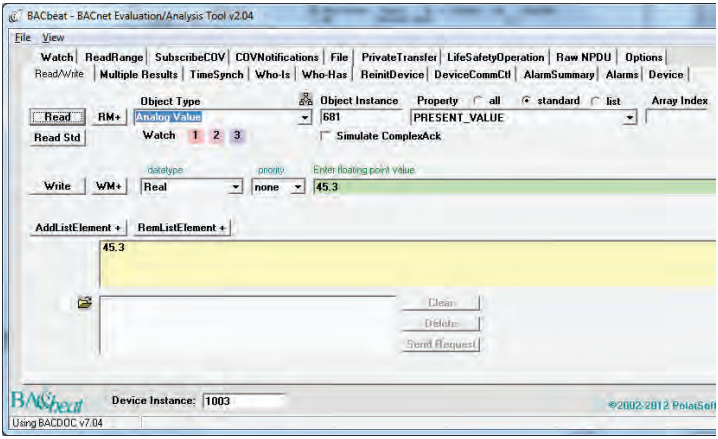
Who-Is

Select the **Who-Is** tab and click on the **Transmit Ranged WhoIs**. A list of BACnet devices will be shown. The AC30 BACnet devices names will be the same as the AC30 Drive Name.



ReadProperty and WriteProperty

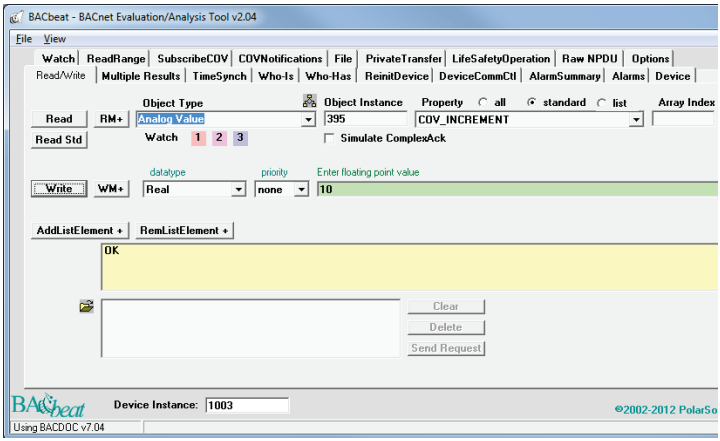
In this example the AC30 parameter **0681 Comms Reference** value is being read and written to.



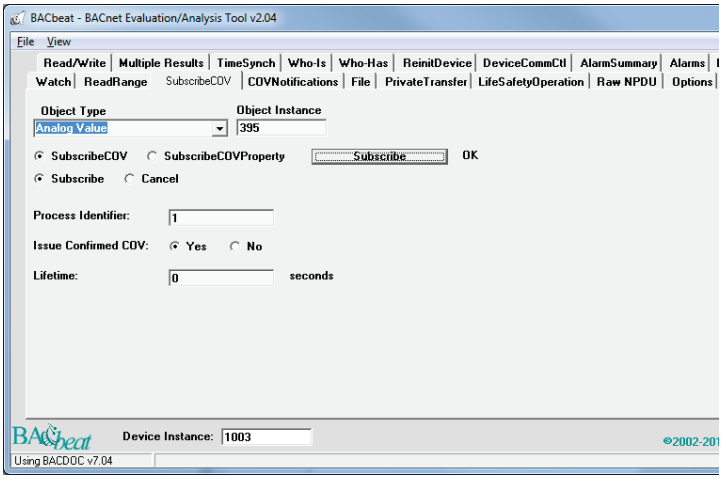
Change Of Value (COV) Notifications

In this example the AC30 parameter **0395 Actual Speed Percent** is being monitored. This must be added to the Write Process Data.

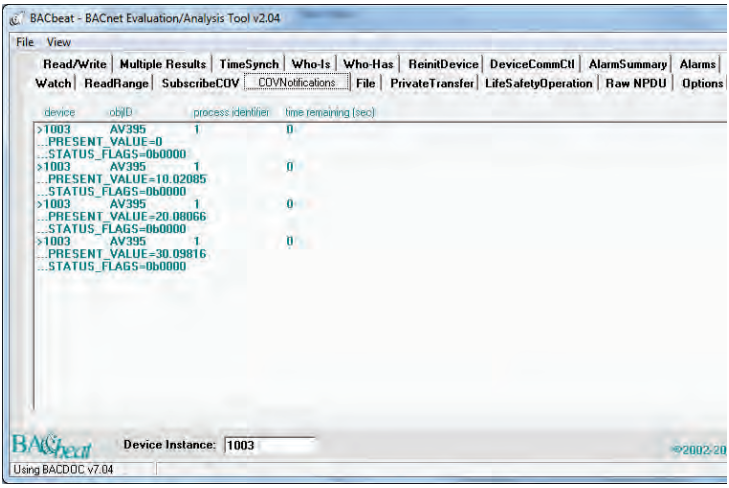
The COV Increment property sets how much the Present Value of an Analog Value object must change by before a COV notification is sent. On instance 395 this is set to 10.0



A device may subscribe to a COV of this instance.

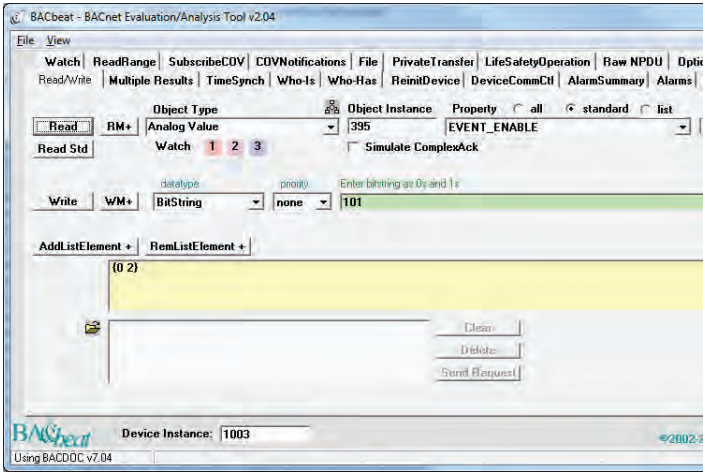


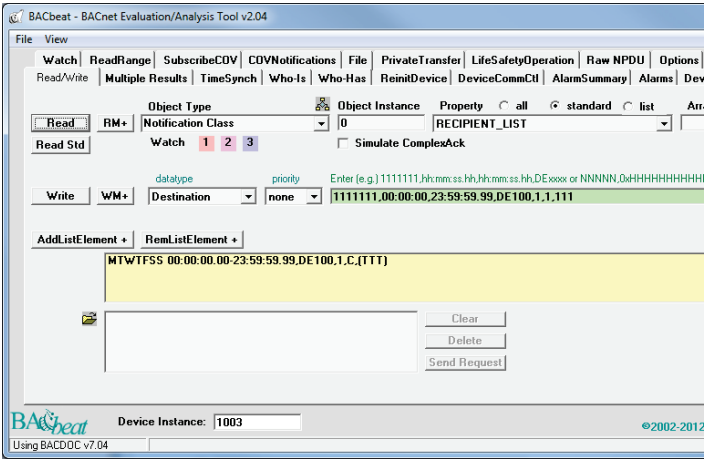
A notification will be sent to the subscribing device when the parameter **0395 Actual Speed Percent** changes by 10.0% or more. This is shown below as the **Actual Speed Percent** parameter value increases from 0 to over 30% .



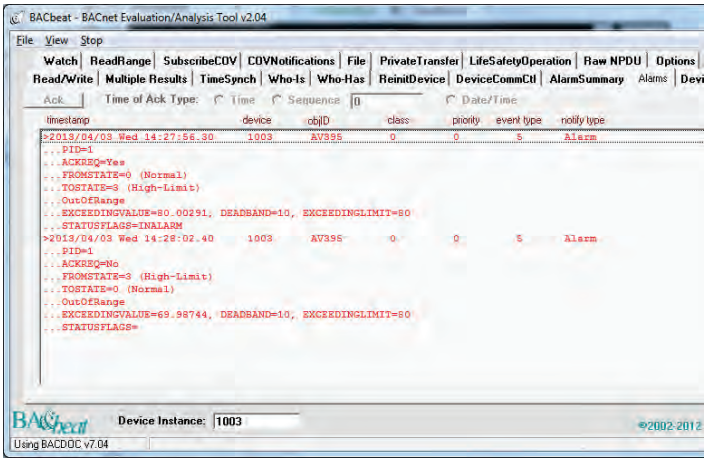
Alarms/Events

In this example an alarm is set up using the Analog Value Alarm Settings and Notification Class Settings in the Configuration Summary above.





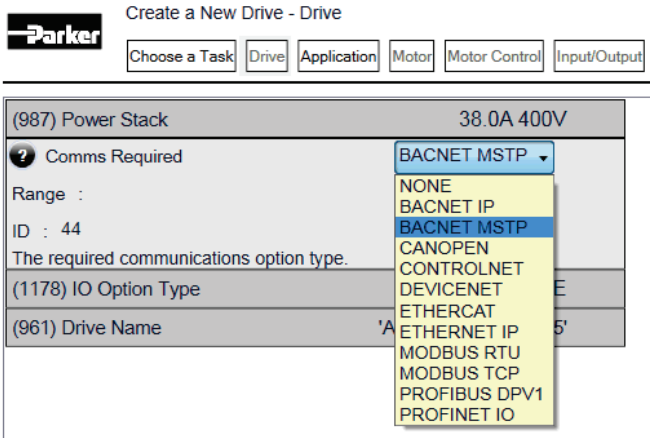
A notification will be sent when the parameter **0395 Actual Speed Percent** value exceeds 80% in which case the Analog Value status flags will change to **In_Alarm**. Subsequently when the parameter value drops below 70% the status flags will be cleared.



Configuring the AC30

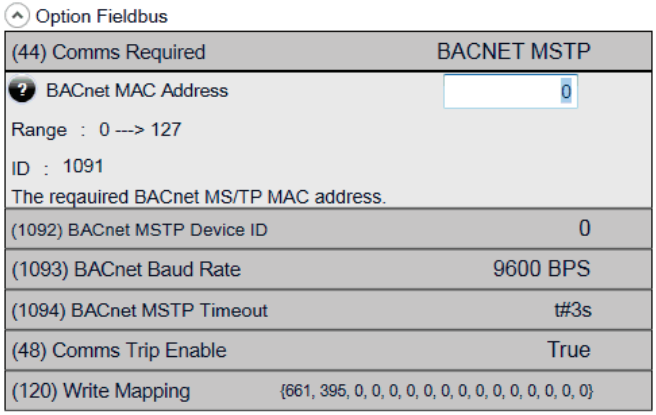
AC30 Parker Drive Quicktool (PDQ)

When performing an online configuration, the fitted option card will automatically be selected. In offline mode, parameter **0044 Comms Required** must be set to **BACNET MSTP**.

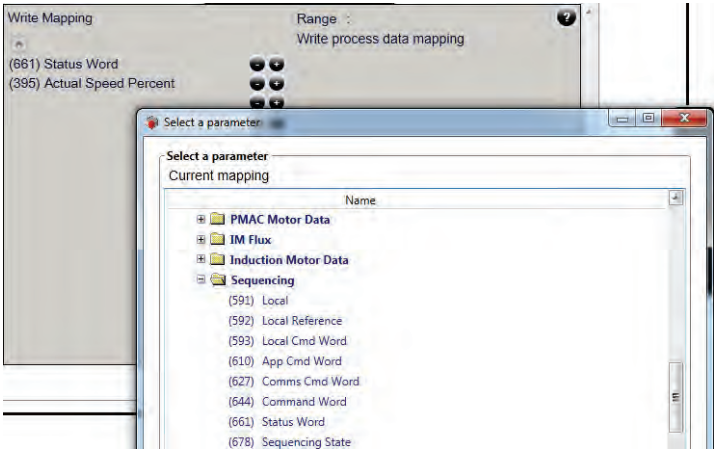


In the Application tab, the following settings are available in the Communications block.

Set the **1091 Bacnet MAC Address**, **1092 BACnet MSTP Device ID**, **1093 BACnet Baud Rate** and **1094 BACnet MSTP Timeout** parameters to the required values.



Add the required parameters to the Write Process Mapping table (parameter **0120 Write Mapping**) by selecting them from the popup window.



Note the Write Process Data mapping ends on the first empty entry.

Lost Communications Trip

Supervised Parameter

The parameter **0047 Comms Supervised** indicates that the BACnet network participation is supervised by another BACnet device.

The Supervised parameter value is set to TRUE when the option is in the PROCESS ACTIVE state.

The Supervised parameter will subsequently change to FALSE if the module changes from the PROCESS ACTIVE state.

Comms Break Trip

The Comms Break trip will generate a trip if a break in communications is detected. A trip event will be generated when a transition from TRUE to FALSE of the parameter **0047 Comms Supervised** occurs.

To enable the Comms Break trip, the parameter **0048 Comms Trip Enable** must be set to TRUE *and* the **COMMS BREAK** bit set in the parameter **0697 Enable 1-32**. The parameter **1094 BACnet MSTP Timeout** must be set to a value other than zero.

For more information on enabling trips see Chapter 10 Trips & Fault Finding in the AC30 Product Manual HA501718U001.

Parameters

Configuration Parameters

0044 Comms Required		Range	RW	Saved	Config
Type	UINT (enumerated)	(1) NONE (2) BACNET IP (3) BACNET MSTP (4) CANOPEN (5) CC LINK (6) CONTROLNET (7) DEVICENET (8) ETHERCAT (9) ETHERNET IP (10) MODBUS RTU (11) MODBUS TCP (12) PROFIBUS DPV1 (13) PROFINET IO	✓	✓	✓
Default	NONE				
Communications option parameter. Sets the required communications option.					

1091 BACnet MAC Address		Range	RW	Saved	Config
Type	UDINT	0 … 127	✓	✓	✓
Default	0				
BACnet MS/TP communications option parameter. Sets the BACnet MAC address.					

1092 BACnet MSTP Device ID		Range	RW	Saved	Config
Type	UDINT	0 … 4194302	✓	✓	✓
Default	0				
BACnet MS/TP communications option parameter. Sets the BACnet Device ID.					

1093 BACnet Baud Rate		Range	RW	Saved	Config
Type	USINT (enumerated)	9600 BPS 19200 BPS 38400 BPS 76800 BPS	✓	✓	✓
Default	9600 BPS				
BACnet MS/TP communications option parameter. Sets the required baud rate.					

1094 BACnet MSTP Timeout		Range	RW	Saved	Config
Type	TIME	0 … 65.0 seconds	✓	✓	✓
Default	3.0 seconds				
BACnet MS/TP communications option parameter. Sets the process active timeout of the option. A value of zero disables the timeout.					

1095 BACnet Max Master		Range	RW	Saved	Config
Type	USINT	1 … 127	✓	✓	✓
Default	127				
BACnet MS/TP communications option parameter. Sets the highest MAC address for a master node on the network.					

1096 BACnet Max Info Frames		Range	RW	Saved	Config
Type	USINT	1 … 255	✓	✓	✓
Default	1				
BACnet MS/TP communications option parameter. Sets the maximum number of frames the master is allowed to send before it has to pass the token.					

0120 Write Mapping		Range	RW	Saved	Config
Type	Array of UINT	0 … Last parameter number	✓	✓	✓
Default	-				
Communications option parameter. Each entry in the table represents the required parameter number. Parameters used for COV notifications and Alarms/Events must be added to this table.					

0048 Comms Trip Enable		Range	RW	Saved	Config
Type	BOOL	FALSE TRUE	✓	✓	×
Default	TRUE				
Communications option parameter. Enables the communications trip.					

Diagnostic Parameters

0045 Comms Fitted		Range
Type	USINT (enumerated)	(0) UNKNOWN (1) NONE (2) BACNET IP (3) BACNET MSTP (4) CANOPEN (5) CC LINK (6) CONTROLNET (7) DEVICENET (8) ETHERCAT (9) ETHERNET IP (10) MODBUS RTU (11) MODBUS TCP (12) PROFIBUS DPV1 (13) PROFINET IO
Communications option parameter. Indicates the communications option fitted.		

0046 Comms State		Range
Type	USINT (enumerated)	(0) SETUP – setup in progress (1) NW INIT – network-related initialisation tasks are being performed (2) WAIT PROCESS – awaiting BACnet request (3) IDLE – N/A (4) PROCESS ACTIVE – a BACnet request addressed to this node has been received within the last Process Active Timeout period, or, if no timeout is specified, the module will stay in this state after the first received BACnet request. (5) ERROR – N/A (6) RESERVED (7) EXCEPTION – unrecoverable error (8) NONE – option not fitted
Communications option parameter. Indicates the state of the communications option fitted.		

1089 BACnet MSTP State		Range
Type	USINT (enumerated)	(0) SETUP – setup in progress (1) NW INIT – network-related initialisation tasks are being performed (2) WAIT PROCESS – awaiting BACnet request (3) IDLE – N/A (4) PROCESS ACTIVE – a BACnet request addressed to this node has been received within the last Process Active Timeout period, or, if no timeout is specified, the module will stay in this state after the first received BACnet request. (5) ERROR – N/A (6) RESERVED (7) EXCEPTION – unrecoverable error (8) NONE – option not fitted
BACnet MS/TP communications option parameter. Indicates the state of the communications option fitted as the parameter **0046 Comms State**, but specifically for BACnet MS/TP.		

0047 Comms Supervised		Range
Type	BOOL	FALSE TRUE
Communications option parameter. Indicates that the BACnet network participation is supervised by another BACnet device.		

0049 Comms Module Version		Range
Type	DWORD	0x00000000 … 0xFFFFFFFF
Communications option parameter. Firmware version of the option communications module.		The most significant byte is the major version number, followed by the minor version number. The least significant byte is the build number.

0050 Comms Module Serial		Range
Type	DWORD	0x00000000 … 0xFFFFFFFF
Communications option parameter. Serial number of the option communications module.		

0051 Comms Diagnostic		Range
Type	USINT (enumerated)	(0) NONE (1) HARDWARE MISMATCH – required communications option does not match that fitted, or no option fitted but one is required. (2) INVALID CONFIGURATION – the configuration of the option is not valid. (3) MAPPING FAILED – the process data mapping is not permitted, e.g. adding read-only parameters to the read process data mapping. (4) EXCEPTION – configuration error (5) UNSUPPORTED OPTION – the fitted option is not currently supported
Communications option parameter. Indicates the state of the communications option fitted.		

0052 Comms Diagnostic Code		Range
Type	DWORD	0x00000000 … 0xFFFFFFFF
Communications option parameter. Diagnostic code associated with the Diagnostic parameter.		

0053 Comms Exception		Range
Type	BYTE	0x00 … 0xFF
Communications option parameter. Exception code associated with the Diagnostic parameter being in EXCEPTION		

0054 Comms Net Exception		Range
Type	BYTE	0x00 … 0xFF
Communications option parameter. Network specific exception code associated with the Diagnostic parameter being in EXCEPTION		

Troubleshooting

Configuration problems can often be identified by looking at the Network Status and Module State LEDs and from the BACnet MSTP state and Comms Diagnostic parameters. Under normal operating conditions the Comms Diagnostic parameter should indicate NONE. Other values are summarized in the Diagnostic Parameters section.

Hardware Mismatch

Comms Diagnostic = HARDWARE MISMATCH

- The required option does not match the actual fitted option.
- No option is fitted but one is required.

Invalid Configuration

Comms Diagnostic = INVALID CONFIGURATION

- Invalid write process data mapping
- Invalid communication settings

Comms Diagnostic = MAPPING FAILED

- Attempting to map a parameter that does not exist.
- Attempting to map a string parameter

AC30 Parameter is not Mapped

Some AC30 parameters are not mapped to BACnet Value objects. See BACnet Parameter Mapping section.

Cannot Access Value Object Property

For COV and Alarm/Event functionality some BACnet Value object properties are only available if the respective AC30 parameter is in the Write Process mapping.

Token not Passed to Master

The MAX_MASTER property should be set high enough to include the highest MAC address of all masters on the network.

Appendix A – Array Parameter Numbers

Some parameters have multiple elements and are classified as parameter arrays. A parameter array has a parameter number that accesses the *whole* of the array. It also has parameter numbers that represent each *element* of the array.

The BACnet option only maps the parameter numbers representing the elements; it does not map the parameter numbers representing the whole of the array.

Array Example

A parameter array called **My Array** has 4 elements.

Parameter Number	Parameter - My Array
0152	Whole array
0153	index 0
0154	index 1
0155	index 2
0156	index 3

If the parameter number of the whole array is 0152, then the parameter number of the element index 0 of the array will be 0153, the parameter number of the element index 1 will be 0154, etc.

Appendix B – Bit String Parameter Numbers

Some AC30 bit string parameters of data type WORD or DWORD have individual named bits. These bits are assigned their own parameter number and are mapped to the BACnet Binary Value object.

Bit String Example with Named Bits

The parameter **0661 Status Word** is a 16-bit word with named bits. The parameter number of bit 0 is 0662, the parameter number of bit 1 is 0663, etc.

Parameter Number	Bit	Parameter – Status Word	BACnet Value Object
0661	-	Whole word	Analog
0662	00	READY TO SWTCH ON	Binary
0663	01	SWITCHED ON	Binary
0664	02	OPERATION ENABLED	Binary
0665	03	FAULTED	Binary
0666	04	VOLTAGE ENABLED	Binary

Note that bits that are not named are not mapped to a Binary Value object.

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